

**Alaska Department of Fish and Game  
Division of Wildlife Conservation  
December 2001**

# **Assessing Wildland Fire Impacts on the Winter Habitat Use and Distribution of Caribou Within Alaska's Boreal Forest Ecosystem**

**Bruce W. Dale**

**Research Performance Report  
1 July 2000–30 June 2001  
Federal Aid in Wildlife Restoration  
Grant W-27-4, Project 3.44**

This is a progress report on continuing research. Information may be refined at a later date.

If using information from this report, please credit author(s) and the Alaska Department of Fish and Game.

**FEDERAL AID**  
**ANNUAL RESEARCH PERFORMANCE REPORT**

ALASKA DEPARTMENT OF FISH AND GAME  
DIVISION OF WILDLIFE CONSERVATION  
PO Box 25526  
Juneau, AK 99802-5526

**PROJECT TITLE:** Assessing wildland fire impacts on the winter habitat use and distribution of caribou within Alaska's boreal forest ecosystem

**AUTHOR:** Bruce W. Dale

**COOPERATORS:** Alaska Department of Fish and Game: William Collins, Earl Becker, Craig Gardner, Brad Scotton, Tom Stephenson, Bob Tobey, Patrick Valkenburg; USGS-Alaska Biological Science Center: Kyle Joly, Layne Adams; University of Alaska Fairbanks: Scott Rupp; University of Vermont: Darien McElwain.

**GRANT AND SEGMENT NR.:** W-27-4

**PROJECT NR.:** 3.44

**SEGMENT PERIOD:** 1 July 2000 – 30 June 2001

**STATE:** Alaska

**WORK LOCATION:** Nelchina Caribou Herd

---

In July 1999, the Alaska Department of Fish and Game-Division of Wildlife Conservation (ADF&G) and the US Geological Survey-Alaska Biological Science Center (USGS) began a 5-year investigation of the impact of boreal forest fires on the Nelchina Caribou Herd (NCH) in southcentral and interior Alaska. Wildland fire kills the late succession fruiticose lichens used as winter forage by caribou and it may be decades before such lichens are again abundant. In the late 1980s the NCH shifted its primary winter range use from the historic wintering ground in the Copper and Nelchina River basins to an area of comparatively much higher fire frequency over 150 miles to the northeast. Approximately 85% of the herd now migrates across the Alaska Range to winter in this northern study area (NSA).

## **OBJECTIVES**

This collaborative research effort evaluates relationships between fire history and lichen abundance; caribou habitat selection relative to lichen abundance; and caribou nutritional performance and survival relative to habitat selection, lichen abundance, and spatial distribution. Results of this study will provide information directly applicable to caribou and fire management in Alaska.

## **I. PROGRESS ON PROJECT OBJECTIVES**

During this reporting period, ADF&G and USGS cooperators generated a comprehensive proposal and secured review by several agency and university scientists. In addition, we captured, weighed and measured body size parameters of >80 caribou in early October 1999 and 2000. We deployed 35–40 conventional radiocollars on each cohort of 4-month-old female calves and maintained a sample of >20 GPS radio collars on adult females. We estimated survival rates and habitat use patterns by obtaining >1200 relocations of radiocollared animals by aerial radiotelemetry and >20,000 relocations from GPS telemetry each year. We evaluated the seasonal nutritional

performance of individual caribou by recapturing and handling surviving caribou in April 2000 and 2001 and again the following October. Blood samples were collected at each handling for evaluating the use of stable isotopes as indicators of dietary lichen and nutritional status in collaboration with T. Stephenson (ADF&G, Kenai Moose Research Station). Weight change of calves was variable as calves gained weight over the winter of 1999–2000 but lost weight during the winter of 2000–2001. Caribou strongly avoided boreal forest stands within the NSA that had burned since 1966.

We evaluated caribou habitat selection relative to post-fire stand-age by comparing locations caribou used to random sites. We estimated stand age, forage lichen cover, lichen biomass, cover of other vegetation, and other habitat parameters within the NSA by on-site point sampling at a random subset of 120 of the conventional caribou locations and at 100 random locations. Caribou forage lichens were scarce on stands that had burned within the last 60 years for both random and used sites indicating a lengthy recovery period for burned winter range. Caribou strongly selected for older stands that had abundant primary and secondary caribou forage lichens.

Cover (%) of forage lichens correlated strongly with biomass suggesting that remote sensing of percent cover can be used to estimate winter forage availability. In addition, we evaluated forage lichen abundance at 50 random sites and 50 sites used by caribou during late winter 1980–1985 in the historic winter range within the Nelchina Basin.

Because on-site sampling is expensive and time-consuming, we developed a technique for estimating forage lichen abundance using aerial digital videography. While we had proposed to evaluate various aircraft and imaging formats, our initial results employing cost effective digital videography from fixed-wing aircraft proved satisfactory. We established fixed plots on 5 stands representing a broad range of forage lichen abundance. We adjusted camera settings and flight parameters until we acquired images that provided for the detection of forage lichen cover as low as 10–15%. Digital images of 1000m x 40m transects were then acquired at all the used and random on-site sampling locations. We will estimate lichen cover from the images and compare them (via regression) to the on-site measurements of cover and biomass. Subsequently, we will use aerial videography to generate lichen abundance estimates.

We established experimental plots to evaluate the influence of fire on lichen regeneration and growth on the historic winter range. Lichen fragments were “seeded” on burned and unburned, spruce-shaded and unshaded treatments of moss and duff (or mor) substrates. In addition, lichens were marked to verify the presence of annual nodal branching for use as markers to measure annual growth of individual thalli. These experiments were reevaluated during the summer of 2001 and will be visited again in 2002.

A pilot study was initiated to evaluate the feasibility of using tame caribou to conduct on-site field trials of forage selection, foraging efficiency, and nutritional performance within stands of various ages in the NSA and within the historic winter range. Four 1-day-old female Nelchina caribou calves were captured and hand-raised in Palmer and at the Kenai Moose Research Station. On March 1, 2001, these animals were transported to temporary pens on the historic winter range. We collected blood and urine samples and weighed the animals immediately prior to and after each trial. After a period of adjustment to range conditions, activities of individual caribou were recorded every 15 minutes over two 24-hour periods and diets were scan sampled. At the end of two weeks, we transported the caribou to the comparatively lichen-rich areas of the NSA. Following that 2-week trail, we conducted an additional 1-week replicate trial on each range. Caribou lost weight, foraged less selectively, and ruminated longer on the historic winter range. Caribou were more selective and gained weight on the NAS. Subsequently, we plan to conduct field trails over a range of lichen availability and snow conditions to further evaluate caribou foraging efficiency, diet selection, and nutritional performance for different stand ages and lichen availability.

We established a cooperative effort with Scott Rupp and the University of Alaska to model the influence of fire frequency, as influenced by fire management or climate change, on expected availability of caribou winter range. An existing frame-based model, ALFRESCO, will be employed to estimate the total area, spatial distribution, and age distribution of black spruce stands within the NSA under various fire regimes. We will combine the output of that model with the lichen abundance-stand age relationships and caribou habitat selection for stand-age to estimate the total forage lichen biomass and total area of selected winter habitats to rank winter range under various fire regimes.

**II. SUMMARY OF WORK COMPLETED ON JOBS IDENTIFIED IN ANNUAL PLAN THIS PERIOD**

This year's progress report reflects the complete merging of the original federal aid study and the companion studies initiated by USGS with USDI special projects funding. Therefore, the jobs originally identified in the annual plan no longer adequately reflect the scope of the cooperative project and should be revised to reflect the context of the larger effort and the federal aid annual report format.

**III. ADDITIONAL FEDERAL AID-FUNDED WORK NOT DESCRIBED ABOVE THAT WAS ACCOMPLISHED ON THIS PROJECT DURING THIS SEGMENT PERIOD**

There was none

**III. RECOMMENDATIONS FOR THIS PROJECT**

Work with federal aid staff to appropriately revise project objectives and jobs.

**V. PUBLICATIONS** None.

**VI. FEDERAL AID TOTAL PROJECT COSTS FOR THIS SEGMENT PERIOD**

\$ 45,000

**VII. PREPARED BY:**

Bruce Dale  
Wildlife Biologist III

**APPROVED BY:**

\_\_\_\_\_  
Steven R Peterson, Senior Staff Biologist  
Division of Wildlife Conservation

**SUBMITTED BY:**

Don Spalinger  
Research Coordinator

\_\_\_\_\_  
Wayne L Regelin, Director  
Division of Wildlife Conservation

**APPROVAL DATE:** \_\_\_\_\_